APPENDIX M

Rainwater Harvesting Systems

Appendix M is not adopted as a part of the model code. Appendix M is adopted under ORS 455.060. An individual seeking to install a rainwater harvesting system shall request approval from the Authority Having Jurisdiction. A building official or inspector shall recognize the installation of rainwater harvesting systems according to the provisions of Appendix M.

M 1 Preliminary Information.

M 1.1 Rainwater harvesting systems used for potable water applications present potential risks if not installed, maintained, and properly operated. The Authority Having Jurisdiction does not oversee the maintenance and therefore safety of your system. It is the sole responsibility of the owner of the system to maintain and use the system in a safe and responsible manner. This appendix is intended to set out construction standards dealing with the initial installation of the system components, recommended materials, water treatment and frequency of water testing. Following the standards of this appendix will improve the quality of the water collected and help the installer recognize potential safety problems. The proper system design, maintenance and use are the responsibility of the building owner.

M 1.2 Drinking water contamination can occur in many forms and may not be obvious to the consumer. Therefore testing at least every six (6) months is advised. Standard coliform tests for microbial contaminants should be performed at least every six (6) months. If chemical disinfectants are used, chemical residual levels should be tested as recommended by the disinfection system manufacturer. Chemical testing for heavy metals (lead, mercury, arsenic, cadmium at a minimum) should be performed at least once a year. A host of other chemical contaminants can be found in collected rain water from environmental sources, animal sources and from materials used in and around the neighborhood from which the rainwater is collected. Insects, animals, bacteria, viruses and parasites create potential sources of contamination of a water supply that is not properly serviced and maintained.

M 2 Materials.

M 2.1 All building materials which may come into contact with water collected in the rainwater harvesting system shall be non-toxic and incapable of leaching into the collected water. This includes under normal conditions or conditions of lowered PH caused by acid rain. All water contact materials shall be listed to the NSF 61 standard or American Water Works Association (AWWA) for potable water use. A list of approved component standards is listed in Table 14-1 of this code.

M 2.2 Collection roofing, gutters, piping, fittings, valves, screens, downspouts, leaders, flushing devices, tank liners or epoxy coatings and direct contact tanks shall be listed to the NSF 61 standard, AWWA for potable water use..

M 2.3 All surfaces, tanks and equipment shall be washed clean before it is put into service.

M 3 Water Uses.

M 3.1 Harvested rainwater may be used for private potable or non-potable uses if it has been treated to an appropriate quality. However, only water which has been treated to an appropriate level or quality may be used. Harvested rainwater which is provided as a part of a community water system or a public water supply system shall be under the review and approval requirements of the Oregon Department of Human Services as drinking water. Any potable water serving four or more residential units or any public establishment is subject to Oregon drinking water laws and rules and must be reviewed, approved and regularly monitored by the Oregon Department of Human Services Drinking Water Program.

M 3.2 All piping in the system shall be clearly labeled to identify untreated rainwater and treated potable water. Labeling shall identify the direction of flow. Labeling shall meet ANSI A13.1 Scheme for the Identification of Piping Systems. No part of a private potable water system source, treatment system, plumbing system or water served fixture shall be connected with any part of a public drinking water system.

M 4 Rainwater Collection.

M 4.1 Rainwater shall only be collected from roof surfaces. Roof surfaces shall be constructed of slate, metal, tile, concrete, fiberglass or other approved material. The roof surface shall be coated with an approved epoxy or other material which is safe for drinking water contact. Roofing of wood, tar, gravel, asbestos or asphalt shingles shall not be used. Painted roof surfaces shall be prohibited.

M 4.2 Roof catchment surfaces shall be thoroughly washed before used to collect rain water.

M 4.3 Roof catchments shall have a pitch no greater

than four (4) inches (100mm) in twelve (12) inches (300mm). Roof catchment area shall be based upon the foot print of the roof and not the actual area of the roof surface. The foot print area of the roof catchment shall be calculated by measuring the outside dimension of the roof and multiplying length times width.

M 4.4 Trees and other plants which are above the roof surface gutter elevation and within twenty (20) feet (6096mm) of the gutter edge are prohibited.

M 4.5 Gutters shall be of materials which are safe for contact with potable water or be coated with an approved epoxy or other material which is safe for drinking water contact. Wooden gutters or painted gutters are prohibited.

M 4.6 Gutters shall be screened with an approved material over there entire opening to keep out leaves, debris and other large contaminants. Gutter screens shall not have an opening greater than one-quarter (1/4) inch (6 mm).

M 4.7 Gutters shall have a continuous grade with a minimum slope of one-sixteenth (1/16) inch per foot to the outlet leader with no sags or flat portions where water will collect or stand. Gutters shall be cleaned prior to use and maintained in a clean manner on a regular basis. Run off of wash water shall be diverted from the storage tanks to a location which will not cause damage to property or cause erosion.

M 4.8 Gutter outlets may be connected indirectly to the rain leader with a screened leaf protected receptor inlet.

M 4.9 Gutters intended to capture rainwater for harvesting shall be the continuous or seamless type. Lead bearing soldered seams are prohibited.

M 5 Downspouts, Rain Leaders and Piping.

M 5.1 All piping from gutters to the storage tanks shall be continuously graded from the roof to the tank. Piping shall have a continuous grade with a minimum slope of one-fourth (1/4) inch (6 mm) per foot (300 mm) to the storage tank. Except for first-flush washers, no section of piping shall be installed in a manner which will hold water and not drain completely. Trapping of piping is prohibited.

M 5.2 Plastic piping shall be protected from UV radiation by a factory applied protective coating or painted with a latex paint. Piping and solvent cements shall be approved for potable water use.

M 5.3 Metal rain leaders shall be seamless aluminum, galvanized steel or be coated with an approved non-toxic material. Lead bearing soldered joints are prohibited.

M 5.4 Piping from down spouts to storage tanks shall be a minimum of three (3) inches interior diameter.

M 6 First-Flush Diverters.

M 6.1 All rainwater harvesting systems shall have a first-flush diverter installed in a manner which will divert the first flow of water from the catchment surface.

M 6.2 Water drained from the first-flush diverter will be piped away from the storage tank and terminate in a location which will not cause damage to property or erosion.

M 6.3 First-flush diverters shall be sized so that the minimum volume of the water diverted is at least equal to one (1) gallon (3.8L) per each one hundred (100) square foot (9.3 m2) of catchment area served. The total catchment area shall be calculated per section X 4.3. The interior volume of the first-flush diverter shall be equal to or greater than one (1) gallon (3.8L) per each one hundred (100) square foot (9.3 m2) of catchment area served.

M 6.4 First-flush diverters shall be approved factory assemblies or be constructed of approved materials on site. First-flush diverters constructed on site shall be sized based upon thirty-three (33) inches (838mm) per gallon for three (3) inch (76mm) pipe and eighteen (18) inches (457mm) per gallon for four (4) inch (102mm) pipe. Larger diameter piping may be used and sized based upon internal area at two hundred thirty one (2313) cubic inches (3785cm3) per gallon.

M 6.5 First-flush diverter vessels shall have a cleanout fitting in the bottom of the device. Cleanouts shall be removed and the accumulated debris washed out after each rain event. First-flush diverters shall be provided with an automatic means of self draining between rain events.

M 7 Storage Tanks.

M 7.1 Storage tanks shall be opaque or painted to prohibit algae growth. Polypropylene tanks shall not be painted.

M 7.2 Storage tanks shall be listed for use with potable water. Storage tanks which have been previously used for other purposes are prohibited. Storage tanks must be completely covered and any vent or other opening screened to prevent mosquito breeding. Covers must be sturdy and be constructed in such a way that they will not allow water to pond or collect on the surface.

M 7.3 Storage tanks shall be provided adequate access for cleaning and maintenance purposes.

M 7.4 Storage tanks shall be as close to the catchment area as is practical and protected from direct sunlight

in an approved manner. In areas where freezing temperatures are frequent adequate provisions shall be made to protect the tank and connected piping from freezing.

M 7.5 Storage tanks shall be provided with an overflow equal in size to the tank inlet but not less than four (4) inches (101.6 mm) inside diameter. Overflows shall be piped away from the tank and the water shall be disposed of in a manner which will not cause damage to property or erosion. Over flow drains shall be equipped with durable animal guards or screens. Connection of overflow piping to any drain or sewer piping is prohibited.

M 7.6 Above ground storage tanks shall be placed on a stable, level concrete pad of sufficient strength to accommodate the size and weight of a full tank.

M 7.7 Storage tanks may be constructed of fiberglass, polypropylene, metal, concrete, ferrocement. Wood tanks are prohibited. Metal tank interiors shall be lined or epoxy coated with a material listed to the NSF 61 standard. Plastic tanks shall have a NSF 61 listed lining or be constructed of a listed material.

M 7.8 Buried plastic storage tanks shall be reinforced and able to withstand the weight of the surrounding fill and soil and full capacity of water. Concrete tanks which are above ground or underground must be constructed to withstand the load of water capacity and any other applicable structural forces.

M 7.9 Storage tanks shall be water tight and designed to withstand the structural loads required for their size and shape. Tanks shall be vented. The vent shall turn down and be equipped with a screen with no opening greater than one-eighth (1/8) inch (3mm).

M 7.10 Storage tanks shall not be connected directly to a public or community water supply. Make up water to rainwater storage tanks, when provided, shall be made only through a properly sized and constructed air gap.

M 7.11 Rain barrels may be used at downspouts for collection of water for irrigation only. Rain barrels shall be screened with a fine mesh to prevent mosquitoes from entering.

M 8 Pressure Tanks and Pumps.

M 8.1 Pressure tanks and pumps shall be of an approved type listed, designed and intended for potable water use. Pressure switches shall be set to provide a minimum residual water pressure of fifteen (15) pounds per square inch (103.4 kPa) in the building but shall be set no higher than eighty (80) pounds per square inch (552 kPa). Pressure tanks shall be of the expandable diaphragm type and sized based upon the peak flow capacity of the pump. The minimum size of the pressure tank shall be forty-two (42) gallons (159 L).

M 8.2 Pumps shall be a minimum of ¾ horsepower. A full size check valve shall be installed between the storage tank and the pump inlet. Pump inlet piping shall be a minimum of one (1) inch (25mm). Pressure tanks shall be sized based upon the demand required for the intended use. On-demand type of pump systems may be used which incorporate the pump, motor, controller, check valve and pressure tank.

M 8.3 Pumps shall be at an elevation which is as close as practical to the elevation of the storage tank. Pumps shall be installed in a location which is adequately protected from freezing, overheating or where other potential damage may result.

M 8.4 Water intake supply from storage tanks to pumps shall be from a floating submerged intake pipe with a twenty (20) micron filter. The intake pipe shall be not less than four (4) inches (101.6 mm) below the top surface of the water.

M 9 Water Treatment and Disinfection.

M 9.1 A preliminary screening of all water shall be installed between the catchment and the storage tank. The screen mesh shall not have an opening greater than one-quarter (1/4) inch (6mm). The screen should be washed clean of debris after each rain event.

M 9.2 Initially storage tank water may be treated with chlorine laundry bleach (which does not contain additives) by manually adding one (1) ounce (.0296 L) for every 200 gallons of water in the tank. For non-potable water systems which are used only for exterior irrigation chlorination is not necessary.

M 9.3 All potable water rainwater harvesting systems shall be treated to remove sediments, disease-causing pathogens and parasites.

M 9.4 A minimum of two (2) inline filters, one (1) five (5) micron fiber cartridge filter followed by one (1) three (3) micron activated charcoal filter, shall be installed after the pressure tank or on-demand pump. Cartridge filter elements must be replaced as recommended by the manufacturer.

M 9.5 Following the above filters an automatic disinfection device either chemical injection, ozone generators or ultraviolet (UV) light shall be installed. UV light systems shall be sized based upon the maximum rated flow. UV lamps shall be maintained as per the manufacturers requirements but shall be replaced after not more than ten-thousand (10,000) hours of operation. UV light systems shall be listed to ANSI/NSF 55 standard for Class A UV treatment systems. Ozone generators or chorine pump injectors shall be sized and maintained as per the manufacturer's recommendation.

M 9.6 Harvested rainwater shall be tested at least every six (6) months and found safe by an analytical testing laboratory before drinking. Rainwater harvesting system owners should contact a testing laboratory to learn the proper method of obtaining a sample for testing. Therefore testing at least every six (6) months is advised. Standard coliform tests for microbial contaminants should be performed at least every six (6) months. If chemical disinfectants are used, chemical residual levels should be tested as recommended by the disinfection system manufacturer. Chemical testing for heavy metals (lead, mercury, arsenic, cadmium at a minimum) should be performed at least once a year. A host of other chemical contaminants can be found in collected rain water from environmental sources, animal sources and from materials used in and around the neighborhood from which the rainwater is collected. Insects, animals, bacteria, viruses and parasites create potential sources of contamination of a water supply that is not properly serviced and maintained.